Color Television **Chassis**

TC5.1U
CA

Service
Service
Service

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Service Manual

Contents **Page**

1. Technical Specifications, Connections and Chassis Overview 2
2. Safety Instructions, Warnings, and Notes 3
3. Directions for Use 6
4. Mechanical Instructions 6
5. Service Modes, Error Codes, and Fault Finding 7
6. *Block Diagrams, Test Point Overviews, and Waveforms*
   - Chassis Block Diagram 9
7. *Circuit Diagrams and CBA Layouts* *Diagram* *CBA*
   - Main Board 10 11-12
   - CRT Panel 13 14
   - Layout Side AV Board 14
   - Layout Keyboard Panel 40-P25207-KEA1X 14
   - Layout Keyboard Panel 40-P25207-KEB1XG 14
8. Alignments 15
9. Circuit Descriptions, Abbreviation List, and IC Data Sheets 18
10. Spare Parts List 24
11. Revision List 26

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PHILIPS

1. Technical Specifications, Connections and Chassis Overview

1.1 Technical Specifications

Tuning - technology	:	PLL
Tuning - presets/channels	:	181
Freq Bands	:	Full-Cable
TV Systems Off Air/ Cable	:	NTSC M (3.58 - 4.5)
TV Systems Multi	:	NTSC
Mains voltage	:	90-140V
Mains frequency	:	50/60Hz
Standby Power consumption	:	<1W
Sound Systems	:	BTCS SAP
Audio output (RMS)	:	2x3W
Scan Modes	:	4:3
Sound Features	:	AVL, Mute
Sound Control	:	4 sound modes
	:	Balance
	:	Bass Boost
	:	Treble Boost,
	:	Volume
Menu Languages	:	American English, French, Spanish
Clock/Timer Function	:	Sleep timer
Terrestrial Antenna in	:	75 Ohm (F type)

1.2 Connection overview

1.2.1 Connections

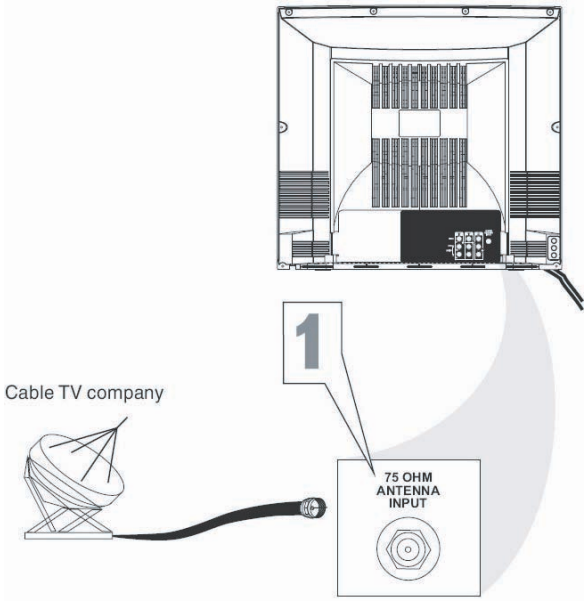

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Figure 1-1 Aerial connection

Aerial - In

-	- F-type	Coax, 75 ohm

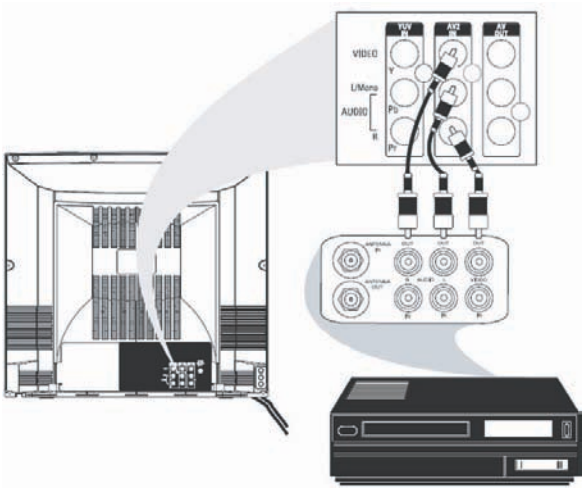

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Figure 1-2 Rear audio and video connections

Cinch: Video CVBS - Out, Audio - Out

Ye	- Video CVBS	1 V_{PP} / 75 ohm
Wh	- Audio L	0.5 V_{RMS} /10 kohm
Rd	- Audio R	0.5 V_{RMS} / 10 kohm

Cinch: Video YUV- In

Gn	- Video Y	1 V_{PP} / 75 ohm
Bu	- Video U	0.7 V_{PP} / 75 ohm
Rd	- Video V	0.7 V_{PP} / 75 ohm

Cinch: Audio - Out

Rd	- Audio - R	0.5 V_{RMS} / 10 kohm
Wh	- Audio - L	0.5 V_{RMS} / 10 kohm

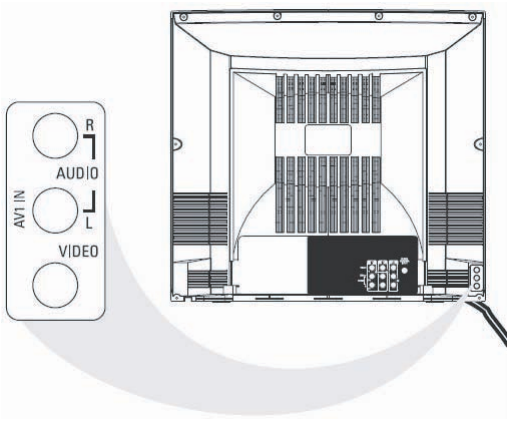

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Figure 1-3 Side audio and video connections

Cinch: Video CVBS - In, Audio - In

Ye	- Video CVBS	1 V_{PP} / 75 ohm
Wh	- Audio L	0.5 V_{RMS} / 10 kohm
Rd	- Audio R	0.5 V_{RMS} / 10 kohm

1.3 Chassis Overview

See Chapter 10, Parts List.

2. Safety Instructions, Warnings, and Notes

Index of this chapter:

2.1 Safety Instructions
2.2 Maintenance Instructions
2.3 Warnings
2.4 Notes

2.1 Safety Instructions

Safety regulations require the following **during** a repair:

- Connect the set to the Mains/AC Power via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol ⚠, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.
- Wear safety goggles when you replace the CRT.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay in particular attention to the following points:

- General repair instruction: as a strict precaution, we advise you to re-solder the solder connections through which the horizontal deflection current flows. In particular this is valid for the:
  1. Pins of the line output transformer (LOT).
  2. Fly-back capacitor(s).
  3. S-correction capacitor(s).
  4. Line output transistor.
  5. Pins of the connector with wires to the deflection coil.
  6. Other components through which the deflection current flows.

Note: This re-soldering is advised to prevent bad connections due to metal fatigue in solder connections, and is therefore only necessary for television sets more than two years old.

- Route the wire trees and EHT cable correctly and secure them with the mounted cable clamps.
- Check the insulation of the Mains/AC Power lead for external damage.
- Check the strain relief of the Mains/AC Power cord for proper function, to prevent the cord from touching the CRT, hot components, or heat sinks.
- Check the electrical DC resistance between the Mains/AC Power plug and the secondary side (only for sets that have a Mains/AC Power isolated power supply):
  1. Unplug the Mains/AC Power cord and connect a wire between the two pins of the Mains/AC Power plug.
  2. Set the Mains/AC Power switch to the "on" position (keep the Mains/AC Power cord unplugged!).
  3. Measure the resistance value between the pins of the Mains/AC Power plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 Mohm and 12 Mohm.
  4. Switch "off" the set, and remove the wire between the two pins of the Mains/AC Power plug.
- Check the cabinet for defects, to prevent touching of any inner parts by the customer.

2.2 Maintenance Instructions

We recommend a maintenance inspection carried out by qualified service personnel. The interval depends on the usage conditions:

- When a customer uses the set under normal circumstances, for example in a living room, the recommended interval is three to five years.
- When a customer uses the set in an environment with higher dust, grease, or moisture levels, for example in a kitchen, the recommended interval is one year.
- The maintenance inspection includes the following actions:
  1. Perform the “general repair instruction” noted above.
  2. Clean the power supply and deflection circuitry on the chassis.
  3. Clean the picture tube panel and the neck of the picture tube.

2.3 Warnings

- In order to prevent damage to ICs and transistors, avoid all high voltage flashovers. In order to prevent damage to the picture tube, use the method shown in figure “Discharge picture tube”, to discharge the picture tube. Use a high voltage probe and a multi-meter (position V_{DC}). Discharge until the meter reading is 0 V (after approx. 30 s).

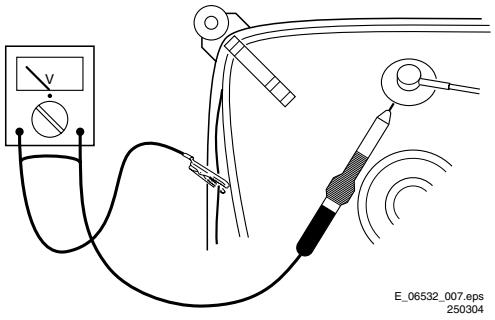

Figure 2-1 Discharge picture tube

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential. Available ESD protection equipment:
  – Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
  – Wristband tester 4822 344 13999.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and prevents circuits from becoming unstable.

2.4 Notes

2.4.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (⏚), or hot ground (⏚), depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a color bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).
- Where necessary, measure the waveforms and voltages with (⊓) and without (⊼) aerial signal. Measure the voltages in the power supply section both in normal operation (⏻) and in stand-by (⏻). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the

semiconductors in the unit, irrespective of the type indication on these semiconductors.
- Manufactured under license from Dolby Laboratories. “Dolby”, “Pro Logic” and the “double-D symbol”, are trademarks of Dolby Laboratories.

2.4.2 Schematic Notes

- All resistor values are in ohms, and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are given in micro-farads (μ= x10^{-6}), nano-farads (n= x10^{-9}), or pico-farads (p= x10^{-12}).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Spare Parts List. Therefore, always check this list when there is any doubt.

2.4.3 Rework on BGA (Ball Grid Array) ICs

General
Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF)BGA has to be discarded.

Device Removal
As is the case with any component that is being removed, it is essential when removing an (LF)BGA, that the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the risk of warping the PWB. To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

Area Preparation
When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA.
Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent.
After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF)BGA.
Note: Do not apply solder paste, as this has been shown to result in problems during re-soldering.

Device Replacement
The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers. So as not to damage neighboring components, it may be necessary to reduce some temperatures and times.

More Information
For more information on how to handle BGA devices, visit this URL: *www.atyourservice.ce.philips.com* (needs subscription, not available for all regions). After login, select “Magazine”, then go to “Repair downloads”. Here you will find Information on how to deal with BGA-ICs.

2.4.4 Lead-free Solder

Philips CE is producing lead-free sets (PBF) from 1.1.2005 onwards.

Identification: The bottom line of a type plate gives a 14-digit serial number. Digits 5 and 6 refer to the production year, digits 7 and 8 refer to production week (in example below it is 1991 week 18).

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230205

Figure 2-2 Serial number example

Regardless of the special lead-free logo (which is not always indicated), one must treat all sets from this date onwards according to the rules as described below.

Figure 2-3 Lead-free logo

Due to lead-free technology some rules have to be respected by the workshop during a repair:
- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment. In general, use of solder paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free soldering tin. The solder tool must be able:
  - To reach a solder-tip temperature of at least 400°C.
  - To stabilize the adjusted temperature at the solder-tip.
  - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature of around 360°C - 380°C is reached and stabilized at the solder joint. Heating time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C, otherwise wear-out of tips will increase drastically and flux-fluid will be destroyed. To avoid wear-out of tips, switch “off” unused equipment or reduce heat.
- Mix of lead-free soldering tin/parts with leaded soldering tin/parts is possible but PHILIPS recommends strongly **to avoid** mixed regimes. If this cannot be avoided, carefully clean the solder-joint from old tin and re-solder with new tin.
- Use only original spare-parts listed in the Service-Manuals. Not listed standard material (commodities) has to be purchased at external companies.
- Special information for lead-free BGA ICs: these ICs will be delivered in so-called "dry-packaging" to protect the IC against moisture. This packaging may only be opened shortly before it is used (soldered). Otherwise the body of the IC gets "wet" inside and during the heating time the structure of the IC will be destroyed due to high (steam-) pressure inside the body. If the packaging was opened before usage, the IC has to be heated up for some hours (around 90°C) for drying (think of ESD-protection!).
  Do not re-use BGAs at all!

- For sets produced before 1.1.2005, containing leaded soldering tin and components, all needed spare parts will be available till the end of the service period. For the repair of such sets nothing changes.

In case of doubt whether the board is lead-free or not (or with mixed technologies), you can use the following method:
- Always use the highest temperature to solder, when using SAC305 (see also instructions below).
- De-solder thoroughly (clean solder joints to avoid mix of two alloys).

Caution: For BGA-ICs, you **must** use the correct temperature-profile, which is coupled to the 12NC. For an overview of these profiles, visit the website *www.atyourservice.ce.philips.com* (needs subscription, but is not available for all regions)
You will find this and more technical information within the "Magazine", chapter "Repair downloads".
For additional questions please contact your local repair help desk.

2.4.5 Alternative BOM identification

In September 2003, Philips CE introduced a change in the way the serial number (or production number, see Figure 2-1) is composed. From this date on, the **third digit** in the serial number (example: AG**2**B0335000001) indicates the number of the alternative BOM (Bill of Materials used for producing the specific model of TV set). It is possible that the same TV model on the market is produced with e.g. two different types of displays, coming from two different O.E.M.s.
By looking at the third digit of the serial number, the service technician can see if there is more than one type of B.O.M. used in the production of the TV set he is working with. He can then consult the At Your Service Web site, where he can type in the Commercial Type Version Number of the TV set (e.g. 28PW9515/12), after which a screen will appear that gives information about the number of alternative B.O.M.s used.
If the third digit of the serial number contains the number 1 (example: AG**1**B033500001), then there is only one B.O.M. version of the TV set on the market. If the third digit is a 2 (example: AG**2**B0335000001), then there are two different B.O.M.s. Information about this is important for ordering the correct spare parts!
For the third digit, the numbers 1...9 and the characters A...Z can be used, so in total: 9 plus 26 = 35 different B.O.M.s can be indicated by the third digit of the serial number.

2.4.6 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages**. While some may not be dangerous in themselves, they can cause unexpected reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

3. Directions for Use

You can download this information from the following websites: http://www.p4c.philips.com
http://www.philips.com/support

4. Mechanical Instructions

See Chapter 10, Parts List.

5. Service Modes, Error Codes, and Fault Finding

5.1 Trouble Shooting

5.1.1 Can not Power On

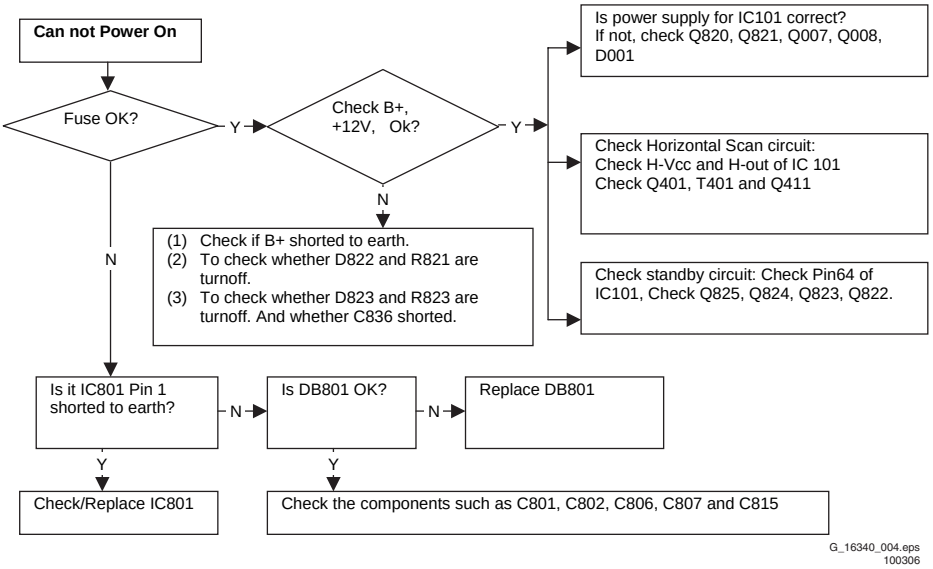
Can not Power On
Fuse OK?
Y
Check B+, +12V, Ok?
Y
Is power supply for IC101 correct? If not, check Q820, Q821, Q007, Q008, D001
N
(1) Check if B+ shorted to earth.
(2) To check whether D822 and R821 are turnoff.
(3) To check whether D823 and R823 are turnoff. And whether C836 shorted.
Check Horizontal Scan circuit: Check H-Vcc and H-out of IC 101 Check Q401, T401 and Q411
Check standby circuit: Check Pin64 of IC101, Check Q825, Q824, Q823, Q822.
N
Is it IC801 Pin 1 shorted to earth?
N
Is DB801 OK?
N
Replace DB801
Y
Y
Check/Replace IC801
Check the components such as C801, C802, C806, C807 and C815
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Figure 5-1 Can not Power On

5.1.2 No Raster, Sound OK

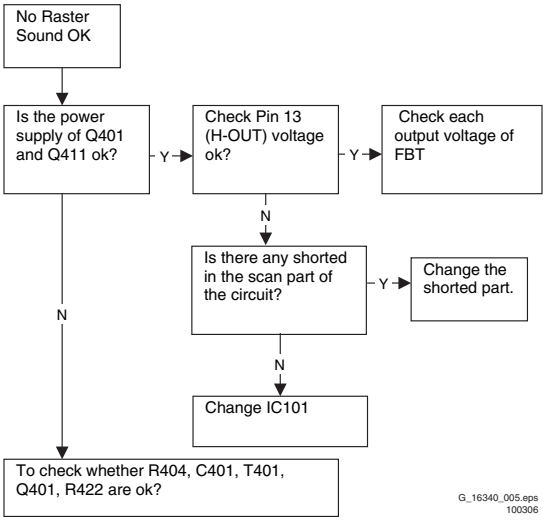

Figure 5-2 No Raster, Sound OK

5.1.3 Raster OK, Sound OK, No TV/AV picture

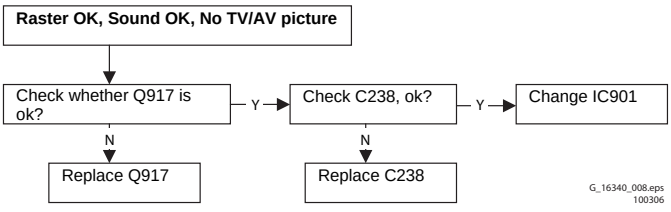

Figure 5-3 Raster OK, Sound OK, No TV/AV picture

5.1.4 Raster OK, Sound OK, No AV picture

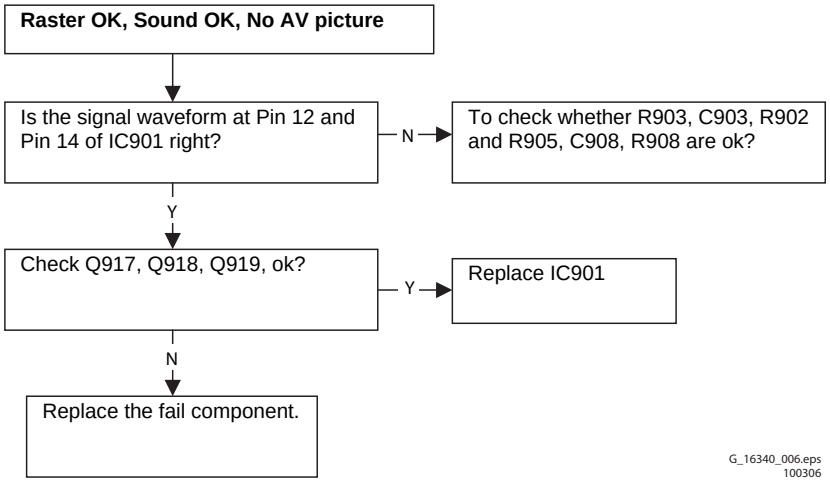
Raster OK, Sound OK, No AV picture
Is the signal waveform at Pin 12 and Pin 14 of IC901 right?
N
To check whether R903, C903, R902 and R905, C908, R908 are ok?
Y
Check Q917, Q918, Q919, ok?
Y
Replace IC901
N
Replace the fail component.
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Figure 5-4 Raster OK, Sound OK, No AV picture

5.1.5 Raster OK, Sound OK, No TV picture

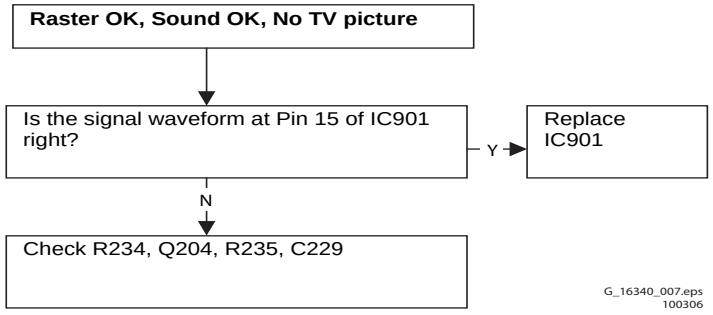


Figure 5-5 Raster OK, Sound OK, No TV picture

5.1.6 No picture, dense noise dots

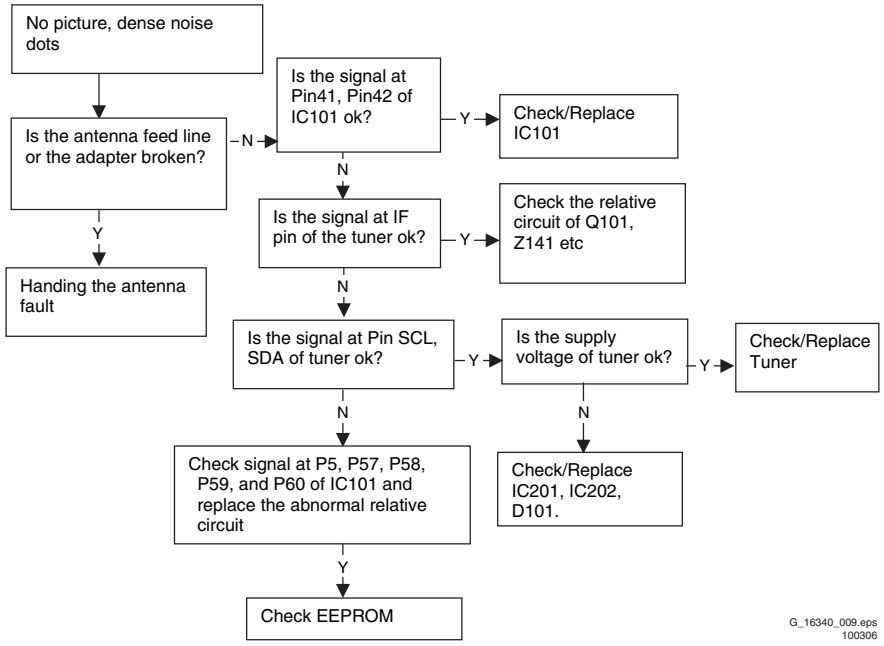
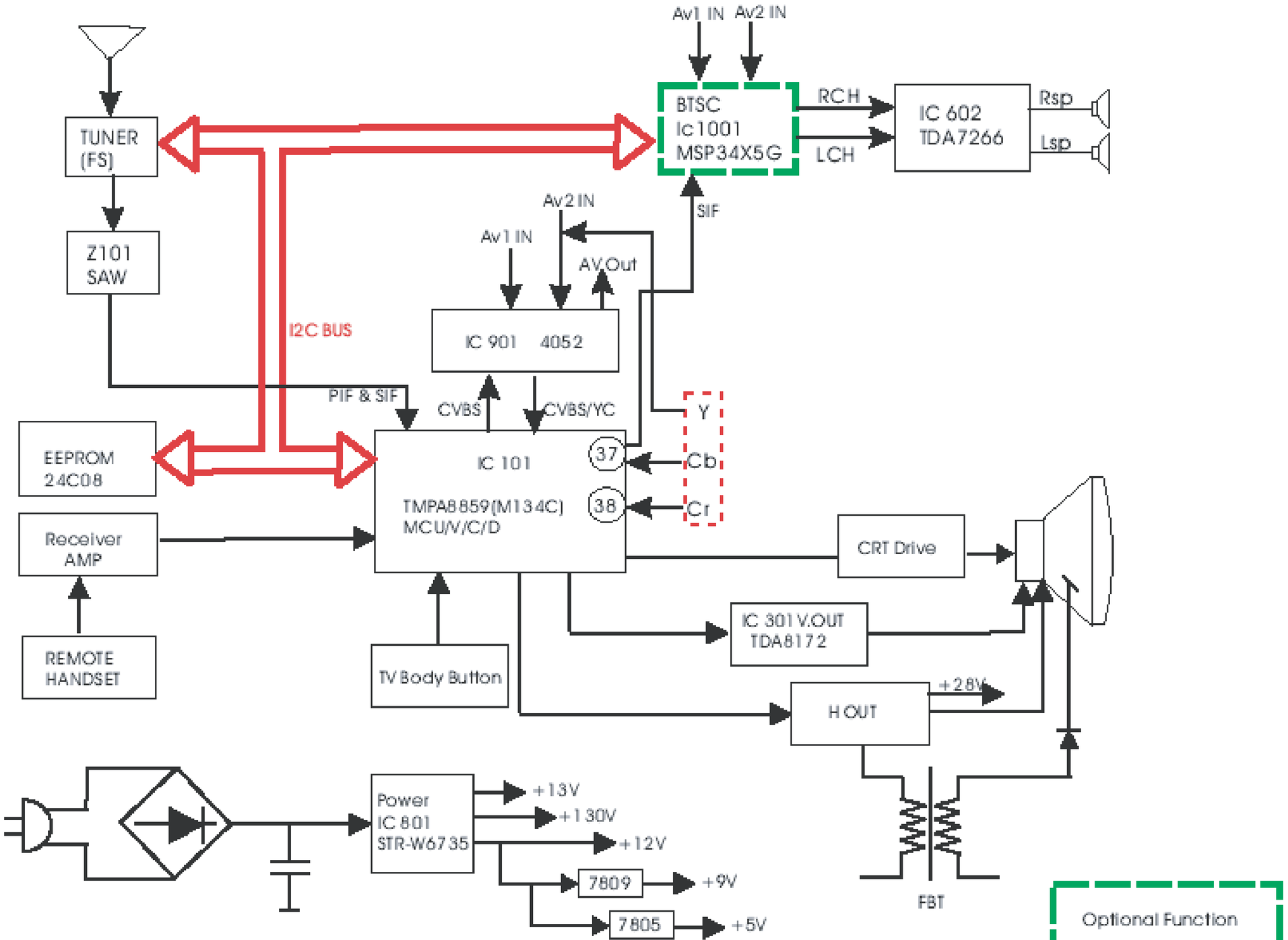


Figure 5-6 No picture, dense noise dots

6. Block Diagrams, Test Point Overviews, and Waveforms

Chassis Block Diagram



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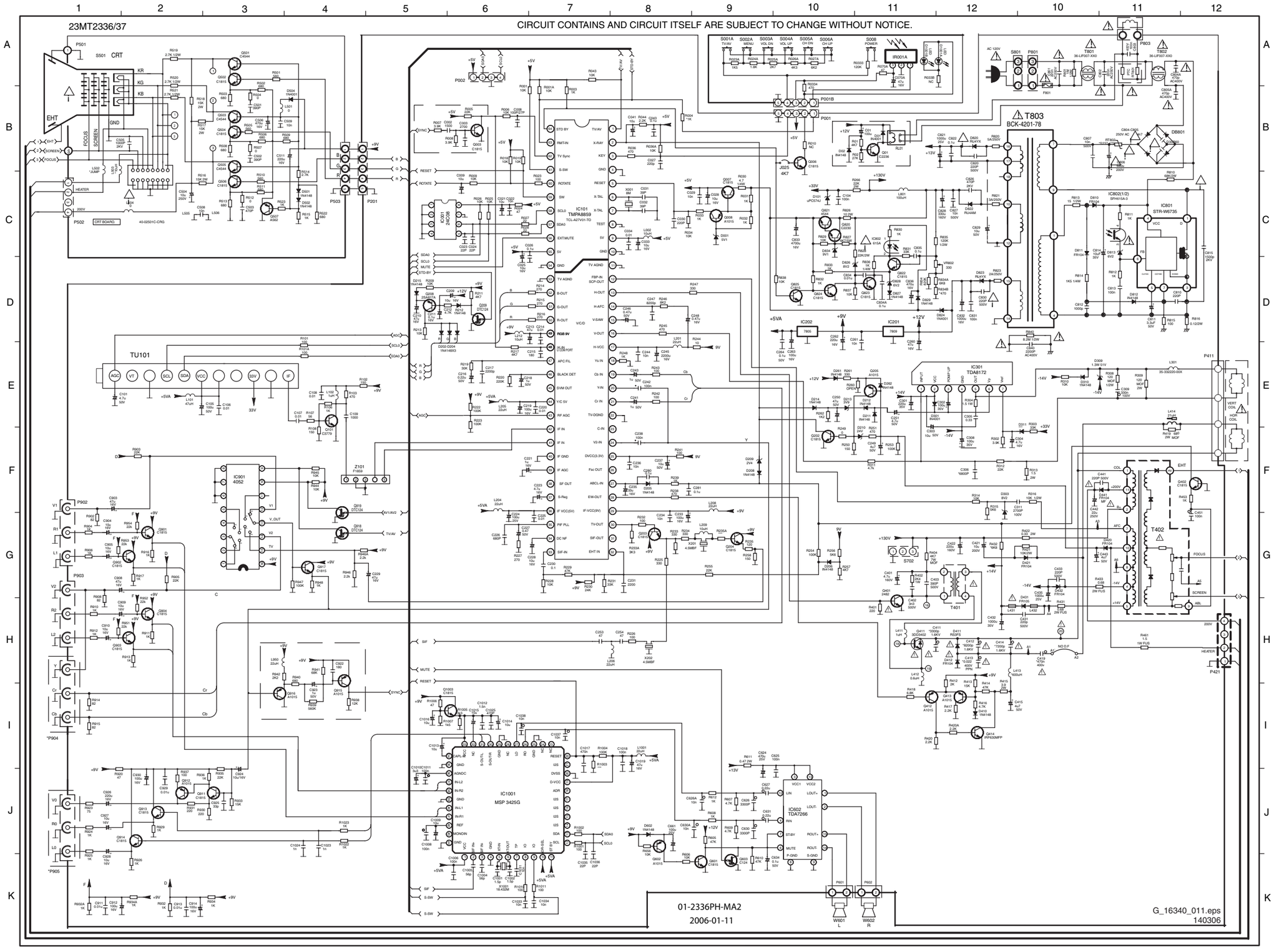
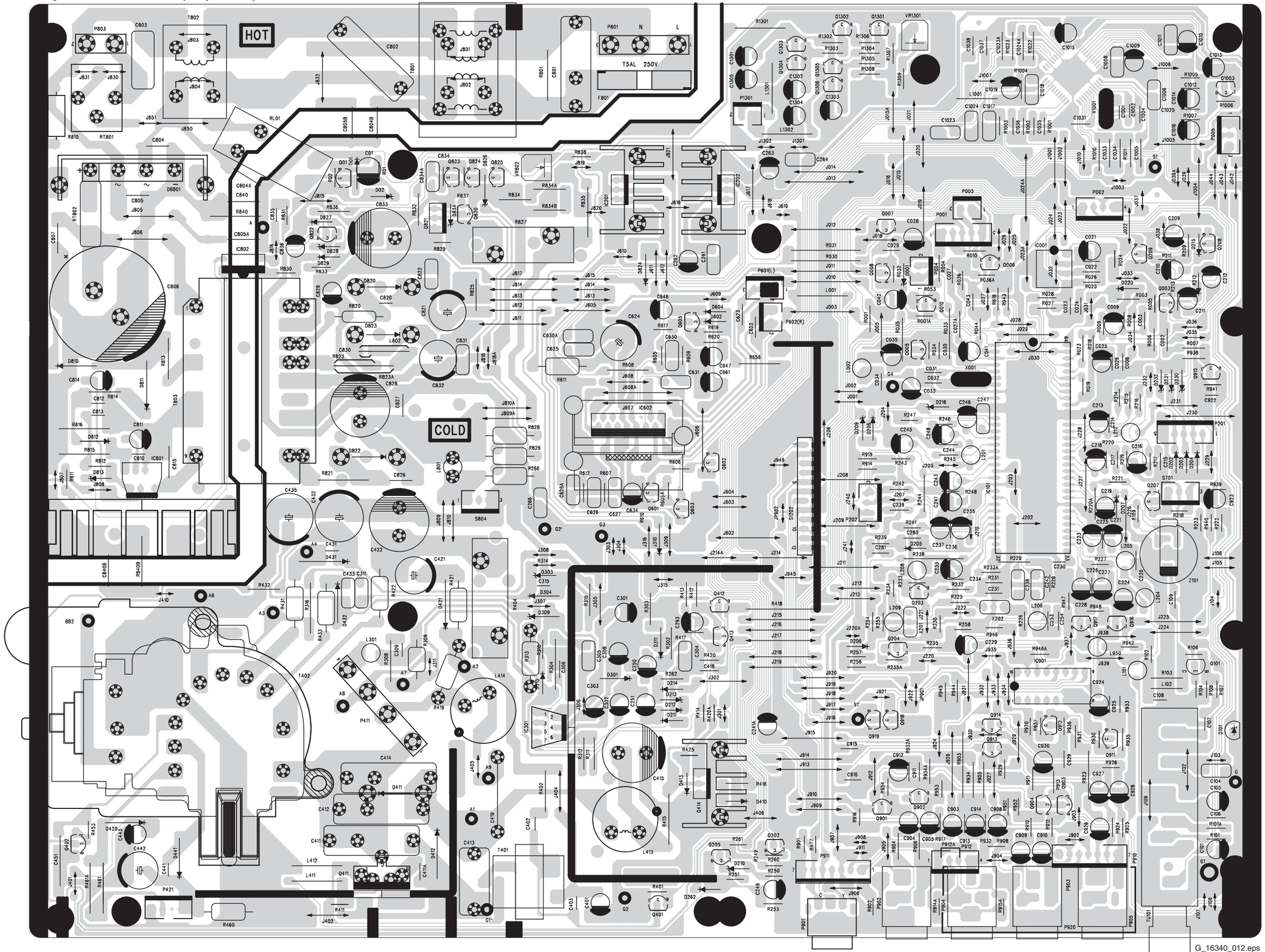
7. Circuit Diagrams and CBA Layouts

Main Board



Layout Main Board (Top Side)



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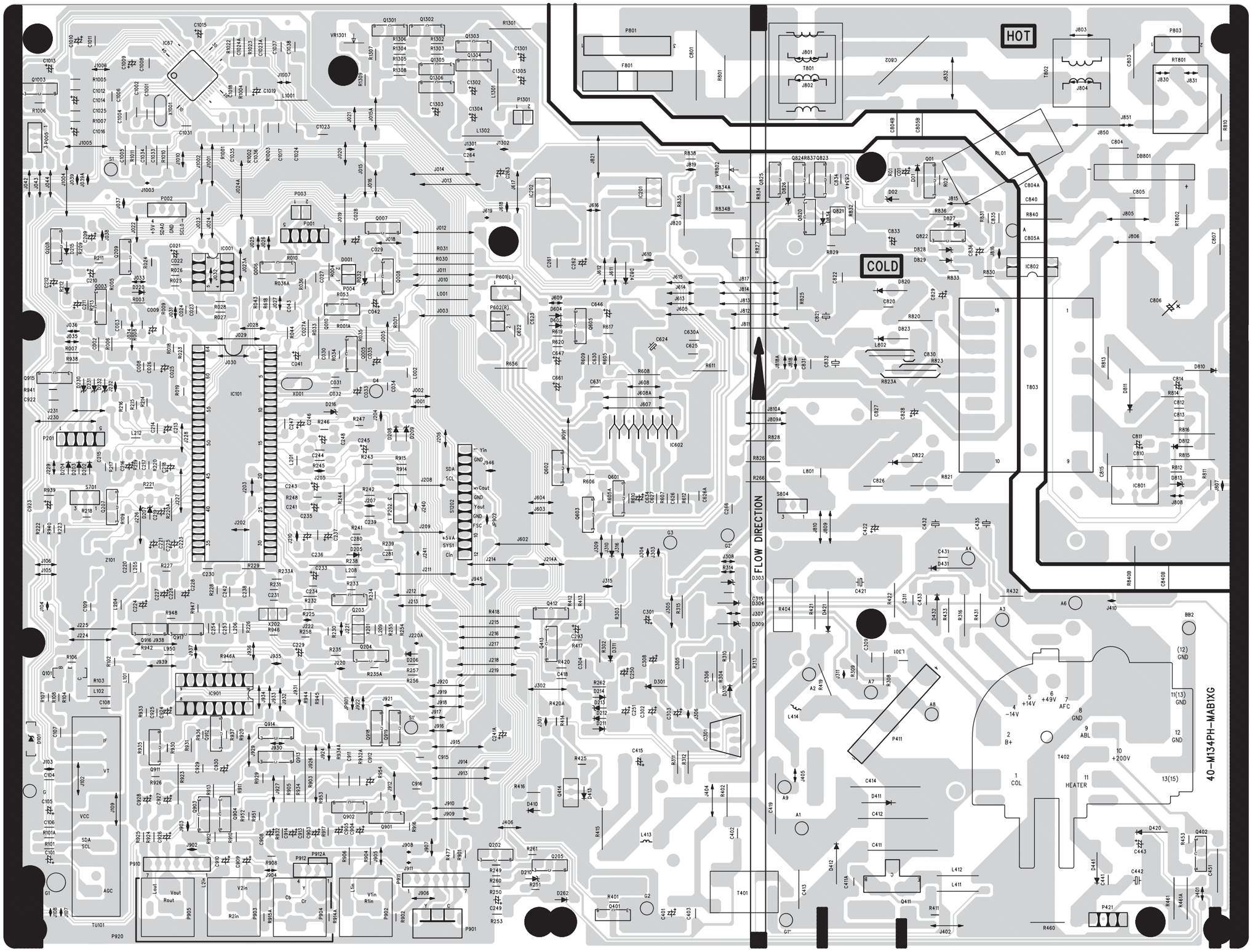
Layout Main Board (Bottom Side)



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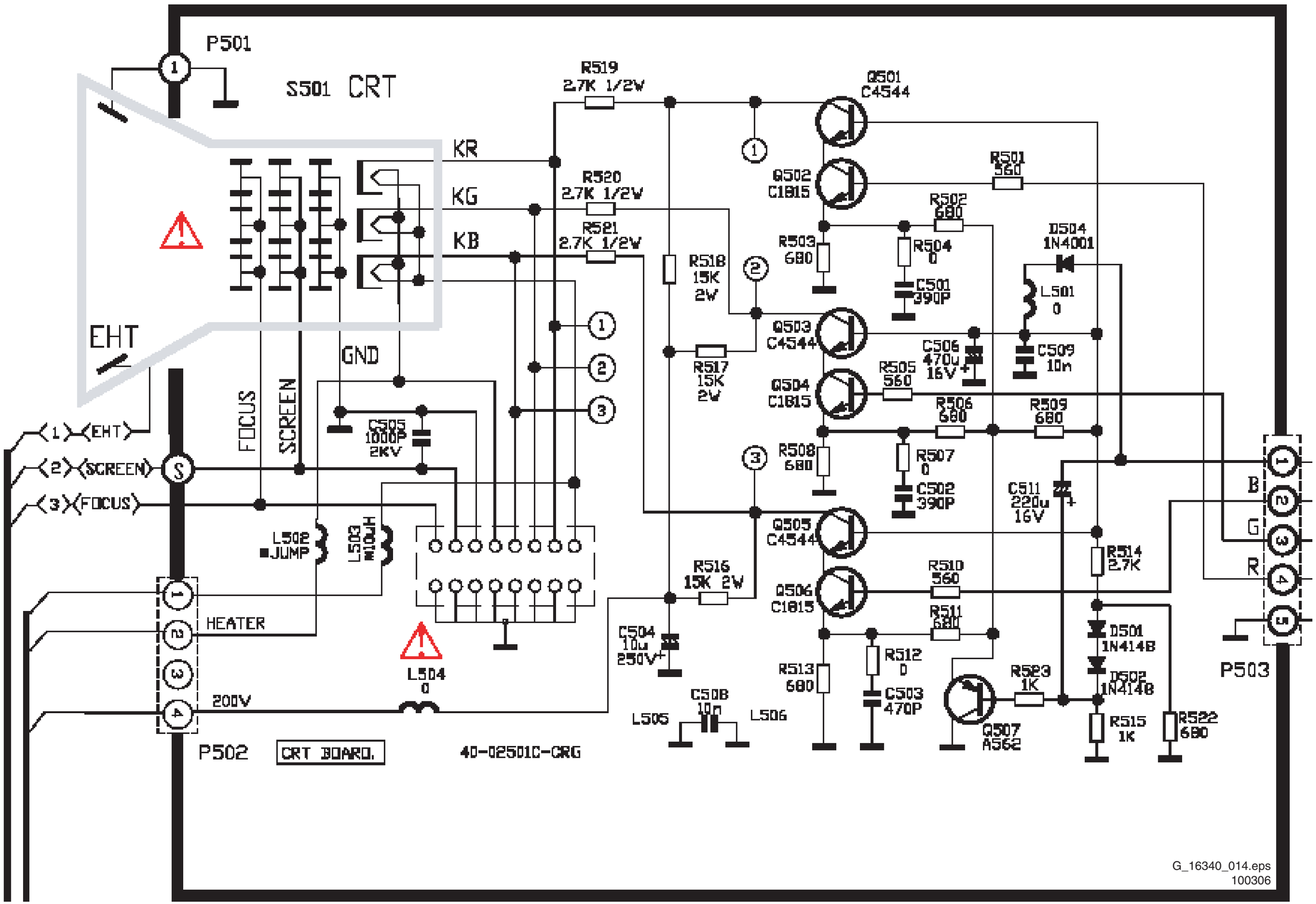
CRT Panel


P501
S501 CRT
EHT
FOCUS
SCREEN
GND
KR
KG
KB
R519 2.7K 1/2W
R520 2.7K 1/2W
R521 2.7K 1/2W
R518 15K 2W
R517 15K 2W
R516 15K 2W
C505 1000P 2KV
L502 JUMP
L503 10uH
L504 0
C504 10u 250V
C508 10n
L505
L506
HEATER
200V
P502
CRT BOARD.
40-02501C-CRG
Q501 C4544
Q502 C1815
Q503 C4544
Q504 C1815
Q505 C4544
Q506 C1815
Q507 A562
R501 560
R502 680
R503 680
R504 0
C501 390P
D504 1N4001
L501 0
C506 470u 16V
C509 10n
R505 560
R506 680
R509 680
R508 680
R507 0
C502 390P
C511 220u 16V
R514 2.7K
R510 560
R511 680
R512 0
C503 470P
R513 680
R523 1K
D501 1N4148
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R515 1K
R522 680
P503
B
G
R
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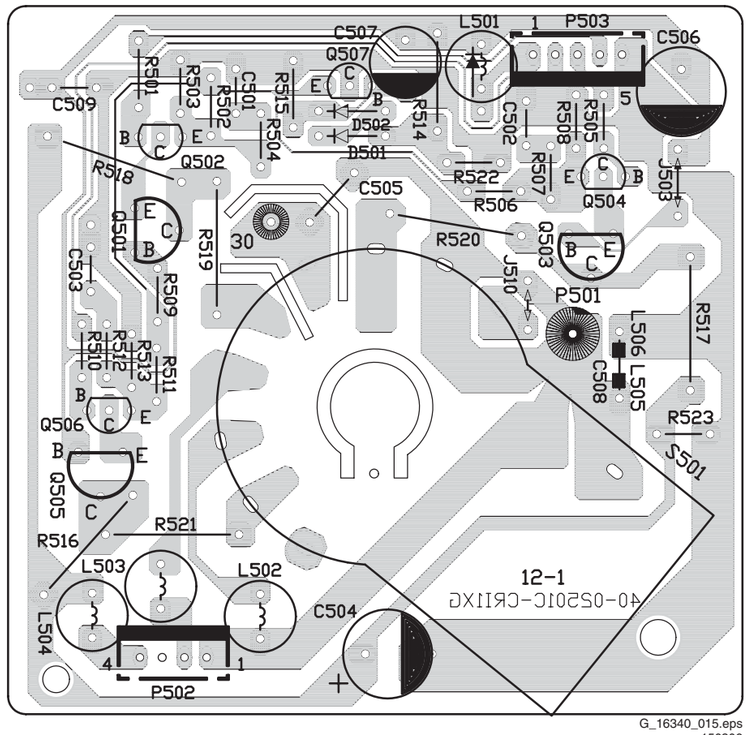
Layout CRT Panel



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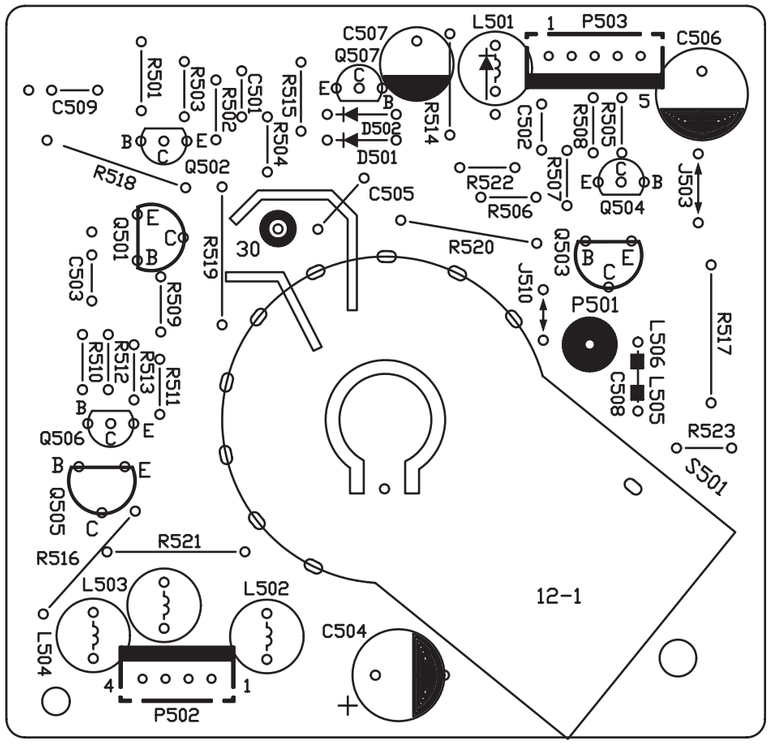
Layout CRT Panel



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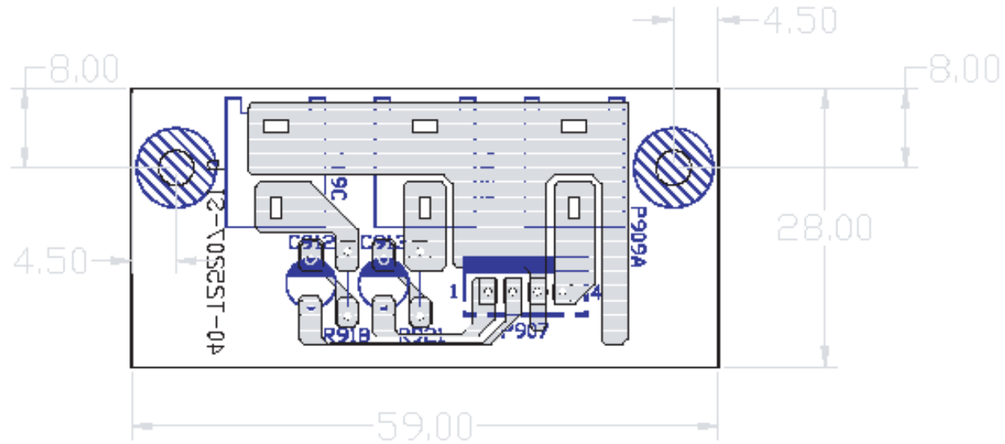
Layout Side AV Board



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Layout Keyboard Panel 40-P25207-KEA1X

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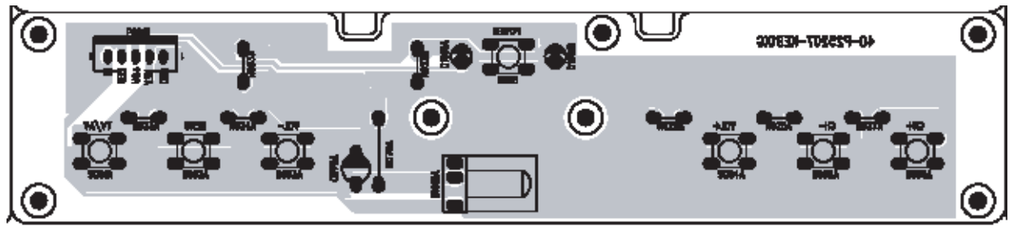
Layout Keyboard Panel 40-P25207-KEB1XG



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8. Alignments

8.1 How to Put the Set into Factory Mode

- Press the “VOL-” button to minimize the volume.
- Hold the “VOL-” button and simultaneously press the “DISPLAY” button on the remote control.
- Press the “CH+” or the “CH-” button to select the parameter you want to adjust.
- Press the “VOL+” or the “VOL-” button to adjust the selected parameter.
- To put the new values into the memory, leave the factory mode with the “STANDBY” button on the remote control, or switch the set off with the “ON/OFF” button.

8.2 Adjustment of the B+ (BAT) voltage

1. Apply the Philips standard test pattern to the RF input.
2. Connect a DC voltmeter (range >200 Volt) to pins 1 (GND) and 3 (+) of S804 [1].
3. Adjust potentiometer VR802 [2] in STANDARD mode in such a way the voltage reading is 130 +/- 0.5 Volt.

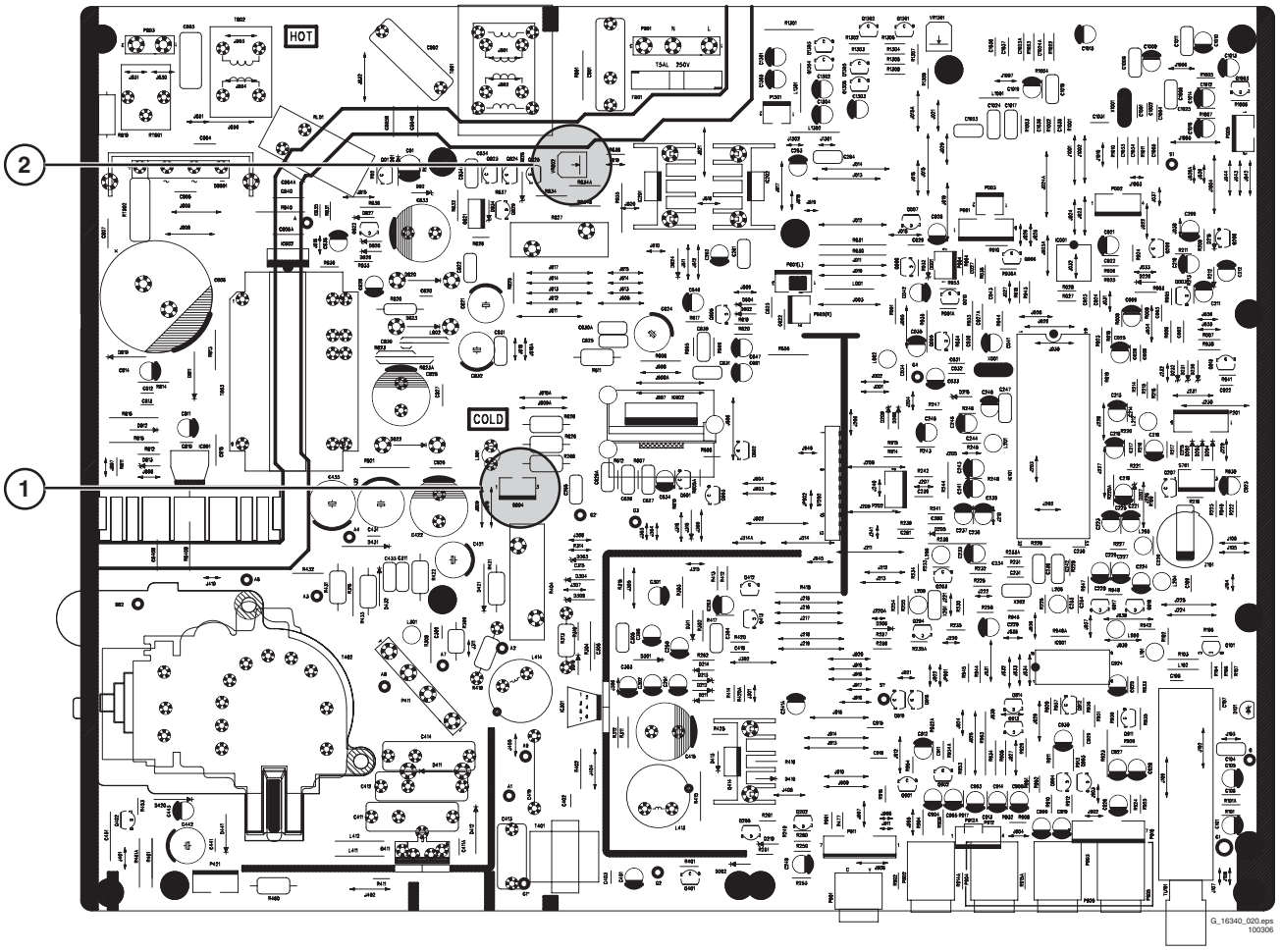

Figure 8-1 Test pin & potentiometer position

8.3 RF AGC Alignment:

1. Apply an 8-scale gray signal (60dB).
2. Adjust the AGC data in Factory Mode in such a way the noise just disappears.
3. Change the signal to 90dB.
4. Measure the voltage at test Pin C of Q101 (this is the Pre-Amplifier output).
5. Write down this voltage, and call it V1P-P.
6. Apply an 8-scale gray signal with Color Bar (90Db)
7. Adjust the AGC data in Factory Mode in such a way the picture is without distortion and interference.
8. Change the signal to 8-scale gray signal (90dB).
9. Measure the voltage at test Pin C of Q101 (Pre-Amplifier output)
10. Write down this voltage and call it V2P-P.
11. Calculate the value VP-P with the following formula: VP-P={(V2P-P)-(V1P-P)}/3.
12. Apply 8-scale gray signal (90dB).
13. Measure the voltage at test Pin C of Q101 (Pre-Amplifier output)
14. Adjust AGC data until the voltage of Pin C of Q101 reaches the value of VP-P (=(V2P-P-V1P-P)/3)

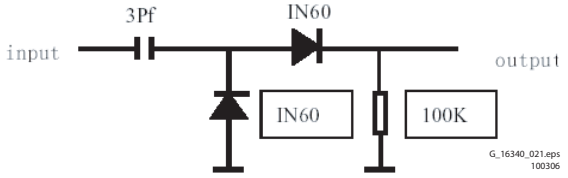

Figure 8-2 Test circuit

8.4 Screen & Focus Voltage Adjustment

1. Apply the test pattern signal in normal status.
2. Enter the Factory mode
3. Press the "AV/CH" button to stop the vertical scan (Note: the RC/GC/BC is preset to 80, GD/BD to 40)
4. Adjust the SCREEN potentiometer on the line output transformer in such a way the horizontal line is just visible on the screen.
5. Turn on the vertical output, and adjust the "FOCUS" potentiometer on the line output transformer in such a way the focus is maximized.

8.5 White Balance Adjustment (NORMAL)

1. Apply the black and white pattern in normal status.
2. Alignment of the normal color temperature
   a. Change the Color Temperature to the normal status
   b. Use a color analyzer to measure the black side of the screen.
   c. By changing the value of RC, GC and BC, set the reading of the color analyzer to PHILIPS standard
      – x=285+/-4
      – y=296+/-4.
   d. Use a color analyzer to measure the white side of the screen.
   e. By changing the value of GD, BD, set the reading of the color analyzer to PHILIPS standard
      – x=285+/-4
      – y=296+/-4.
   f. Separately set the brightness and contrast from minimum to maximum, repeat the step -b- up to and including -e- until the reading of the color analyzer is correct.

The PHILIPS standard is:
– Warm:X=315+/-10, Y=321+/-10
– Cool:X=269+/-10, Y=275+/-10

8.6 Adjustment of Sub-brightness

1. Apply the Grey-scale / Color bar (NTSC signal) to the AV input, in normal status.
2. Enter factory alignment menu 5.
3. Select BRTC
4. Adjust the sub-brightness, until the 2nd dark bar of 8 level Grey scales can just be seen.

8.7 Picture Geometry Adjustment

1. Apply the Philips standard testing pattern in normal status
2. Then enter menu 3
3. Adjust the following data to get the minimum distortion:
   a. HPOS6 (Horizontal Centre)
   b. PARA6 (Level)
   c. TRAP6 (Trapezium)
   d. HSIZE6 (Horizontal Size)
   e. CNRT6 (Top)
   f. CNRB6 (Bottom)
4. Apply the Philips standard testing pattern in normal status.
5. Enter menu 3.
6. Adjust the following data to get the minimum distortion:
   a. HIGH6 (Height)
   b. VP60 (Vertical Center)
   c. VLIN6 (Linearity)
   d. VSC6 (Vertical-S Correction)

8.8 Initialization

Put the set into “Factory Mode” (see “How to Put the Set into Factory Mode”, the first item of this chapter). Press the "SOUND" button, the screen displays "WAIT". When the screen displays FGSFGSFGSFG "OK", the initialization is finished. Now you can enter the following working procedure.

8.9 EEPROM Data:

Note: although all items are adjustable, we only recommend to adjust the items with an asterisk (*). The other items are adjustable as well, but we strongly discourage adjusting them.

Table 8-1 EEPROM Data

EEPROM data										
FAC 01					**FAC 02**					
RC*	GC*	BC*	GD*	BD*	HIGH5	VP50	VLIN5	VSC5	VBLK5	VCEN5
80	80	80	40	40	13	03	0A	0C	00	18
FAC 02										
HIGH6*	VP60*	VLIN6*	VSC6*	VBLK6	VCEN6	VP60*				
27	04	0A	0B	00	2C	04				
FAC 03										
HPOS5	PARA5	TRAP5	HSIZE5	CNRT5	CNRB5	VEHT5	HEHT5			
0C	10	29	13	0A	06	03	03			
FAC 03										
HPOS6*	PARA6*	TRAP6*	HSIZE6*	CNRT6*	CNRB6*	VEHT6	HEHT6			
13	15	12	1D	0B	0C	03	03			
FAC 04										
CNCX	CNTX	BRTX	BRTN	COLX	COLN	TNTX	TNTN			
7F	08	20	20	35	00	28	28			
FAC 05										
BRTC*	COLC	COLP	SCOL	SCNT	CNTC	TNTCT	TNTCV			
40	2C	00	07	0C	4C	40	40			
FAC 06										
ST3	SV3	SV4	SVD	ASSH	SHPN	SHPN				
20	20	19	19	07	10	2A				
FAC 07										
MOD1	MOD2	MOD3	OPT	OPTM1	OPTM2	HDCNT	HSTOP			
60	B0	70	37	C0	00	00	FF			
FAC 08										
RFAGC*	BRTS	OSD	OSDF	CCD OSD	CCD OSDF	TXCN	RGCN			
25	00	21	53	4A	65	1F	16			
FAC 09										
V01	V25	V50	V100	VOLMAX	CURTCEN	GATE	COL-OUT			
46	64	68	6E	32	A5	2A	73			
FAC 10										
MODE4	MODE5	MODE6	MODE7	MODE8	MODE9					
22	0B	19	54	2D	02					
FAC 11										
MPB-STR	MPB-HMC	MPB-HP	MPB-LP	MPB-LIM	SUB-FRE	SUB-HP	VOL-MAI			
43	0D	07	11	00	28	02	00			
FAC 12										
SVM	SVM1	OSD2	OSDF2	PYNX	PYNN	PYXS	PYNS			
05	05	20	64	28	18	22	10			
FAC 13										
CLTM	CLVO	CLVS		ABL	DCBS	FLG0	FLG1			
44	43	43		27	14	82	0D			
FAC 14							**FAC 15**			
HAFC	AGCC	NOIS	ONTM	NSHP	PVLVL	PLMT	RC-C	GC-C	BC-C	GD-C
09	1C	01	08	1A	80	80	00	00	00	00
FAC 16							**FAC 17**			
RC-W	GC-W	BC-W	GD-W	BD-W	YUVGC	YUVBC	D-COL	D-BRI	D-CON	D-SHP
00	00	00	00	00	03	03	32	32	5A	32
FAC 18				**FAC 19**						
S-COL	S-BRI	S-CON	S-SHP	M-COL	M-BRI	M-CON	M-SHP			
32	32	32	32	32	32	1E	32			
FAC 20										
SEG-PO INT1	SEG-POINT2	DATA-VL	DATA-VH	DATA-UF	SPE-POS1	SPE-DATA1	SENSI-ON	SENSI -OFF		
173	407	01	02	08	06	05	00	00		
FAC 21						**FAC 22**				
T-Hz120 -BAS	T-Hz500 -TRE	T-Hz1K5	T-Hz5K	T-Hz10K	C-Hz120-BAS	C-Hz500 -TRE	C-Hz1K5	C-Hz1K	C-Hz10K	
2D	4A	0C	0C	0C	38	3E	0C	0C	0C	
FAC 23					**FAC 24**					
B-Hz120-BAS	B-Hz500-TRE	B-Hz1K5	B-Hz5K	B-Hz10K	COMB1	COMB2	COMB3	AV GAIN	OPTM3	
19	2C	0C	0C	0C	00	05	00	19	08	

9. Circuit Descriptions, Abbreviation List, and IC Data Sheets

9.1 Brief Introduction of the Chassis

9.1.1 Chassis block diagram

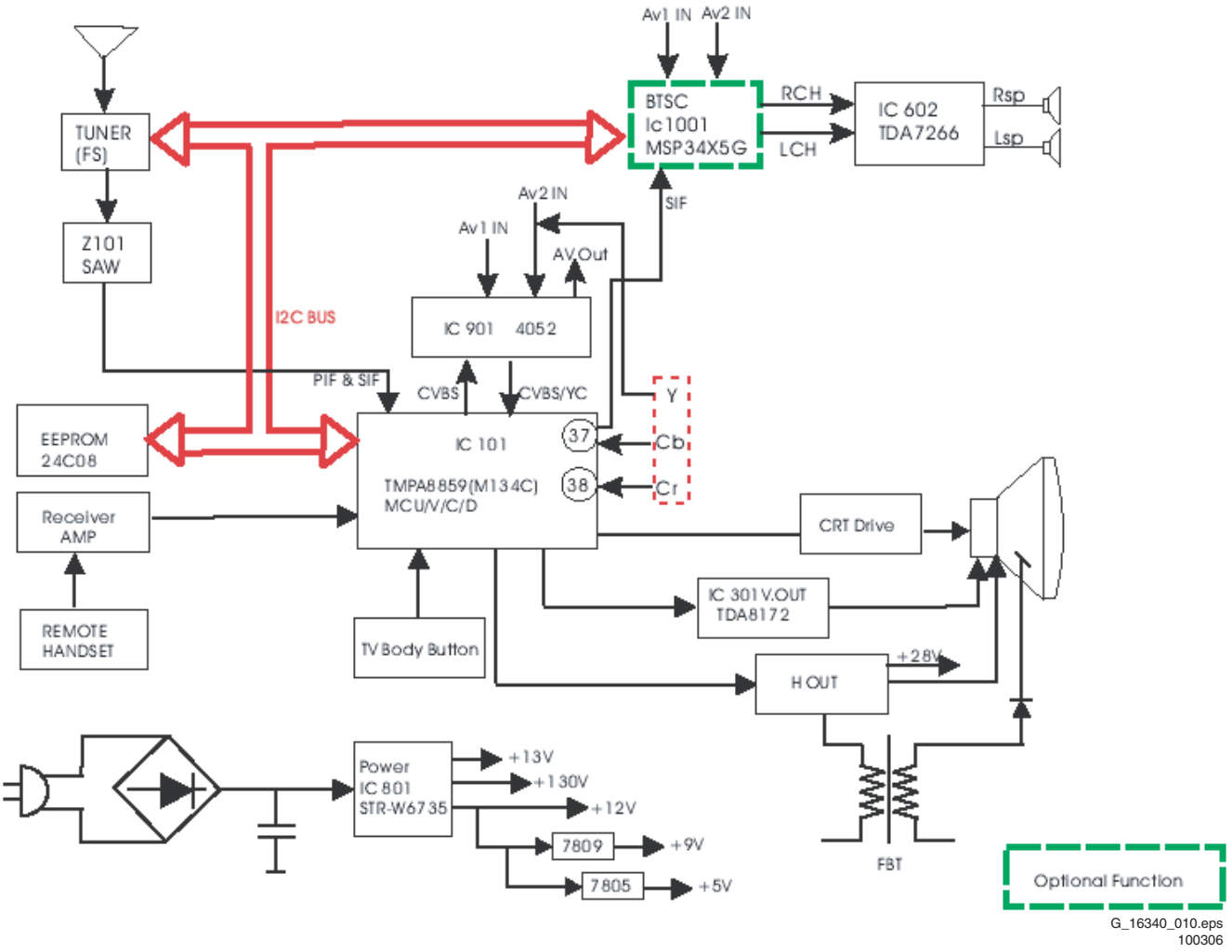

Figure 9-1 Chassis block diagram

9.1.2 Power Supply Section

This section mainly consists of
- IC STR-W6735 (IC801).
- Transformer (T803).
- Bridge rectifier (DB801).
- Accessory circuits.

The supply voltage for this chassis should be AC 110V. The allowed voltage range is 90V to 140V, the frequency range is 50/60Hz.
The AC power with high/low frequency interference goes through an RC filter, consisting of C801, T801, C802, R801, and T802. The filter removes the high/low frequency interference. Then DB801 transforms the AC power to DC power. T803 and IC 801 work in standby state. T803 will provide a power voltage to IC101. IC101 scans for the "KEY IN" signal (Pin 3 of IC101) from the ON/OFF switch on the keyboard. If "KEY IN" = "power on" signal, pin 64 (IC101) will generate a signal to drive the photo coupler (IC8021). It acts as a feed back circuit (feed back to Pin 6 of IC801) for controlling IC801 to adjust MOSFET.
Transformer T803 provides the following voltages:
- +13V voltage from Pin16.
- +130V (B+) voltage from Pin1.
- +12V from Pin 15.
- Pin 15 is also connected to two Positive Voltage Regulators (IC201, IC202) in-series. The outputs of these regulators are +9V and +5V respectively.

The picture below shows IC201 and IC202:

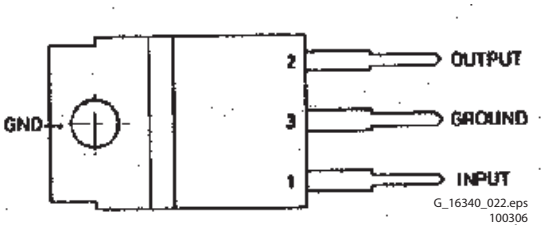

Figure 9-2 IC 201/202

9.1.3 Tuning Section

This section mainly consists of the tuner (TU101), the IF pre-amplifier circuit and the SAWFILTER.

Table 9-1 Tuning section 1

Pin	Symbol	Description
1	AGC	Auto gain control
2	AS	I2C bus address select
3	SCL	I2C bus serial clock
4	SDA	I2C bus serial data
5		
6	BP	Supply voltage tuner section +5V
7	BT	Supply voltage tuning section +31V
8	IF	Intermediate frequency out

Table 9-2 Short specification of the tuner

Receiving Channel	VHF LOW BAND: CH2~B(55.25~127.25MHz) VHF HIGH BAND: CH C~CH W+11(133.25~361.25MHz) CH W+12~69(367.25~801.25MHz)
Receiving System	NTSC
Intermediate Frequency	Picture carrier: 47.74MHz Colour carrier: 42.17MHz Sound carrier: 41.25MHz
Antenna Input Impedance	Unbalanced 75Ohms
Output Impedance	Unbalanced 75Ohms
Band change-over system	Digital change by PLL IC

From Pin58 of IC101 the I2C bus clock signal goes to the tuner. The tuner works during the clock time. IC101 will send out a data signal from Pin57 to control the tuner's working state by controlling the +33V voltage. +33V is provided from Pin10 of T803. That voltage is put into the tuner at Pin7. A circuit inside the tuner transforms +33V into a voltage between 0 and +33V (as a function of the data, sent by IC101).
The AGC signal is a close loop control voltage that keeps the amplitude of the signal constant.
Output of tuner is the Intermediate Frequency signal (IF signal). The IF signal will pass pre-amplifier circuit (refer to the picture below). The amplified IF signal passes the SAW filter and is then sent to IC101 Pin41/42.
IC101 creates a CVBS signal and sends it out from Pin30. CVBS will be selected by IC901, and then pass from Pin13 of IC901 to Pin20/24 if IC101. IC101 will demodulate the CVBS signal into an R, G, B signal. Next IC101 will send this R, G, B signal from Pin50/51/52 to the CRT board.

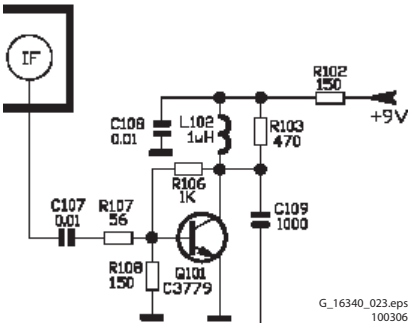

Figure 9-3 Pre-amplifier circuit

9.1.4 Sound Process Section

The SIF signal is sent out together with the TV signal from Pin30 of IC101. It passes through Q203, R225. X202 and a High-pass filter (consisting of C254, L206, C253) filters out the video signal and low frequency interference.

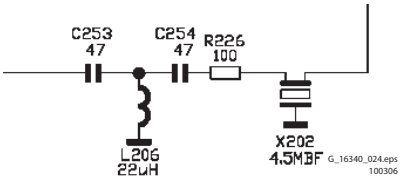

Figure 9-4 Sound process section 1

SIF will be finally sent into Pin2 of IC1001. An analog automatic gain control circuit (AGC) allows a wide range of input levels. The analog-to-digital conversion of the IF sound signal is done by an A/D-converter. The high pass filter, formed by a coupling capacitor at SIF_IN1+ suppresses video components.
IC1001 is controlled via the I2C bus slave interface.
The AV sound signal will be directly sent to Pin37/38 or Pin40/41 of IC1001. Q901/2 and Q903/4 form Emitter-Follower circuits to provide a better load ability.
The (analog) sound signal will go from Pin26/27 of IC1001 to Pin4/12 of IC602. IC602 is a dual bridge amplifier. The output voltage of IC602 drives the speakers. The volume is adjusted via the I2C bus.

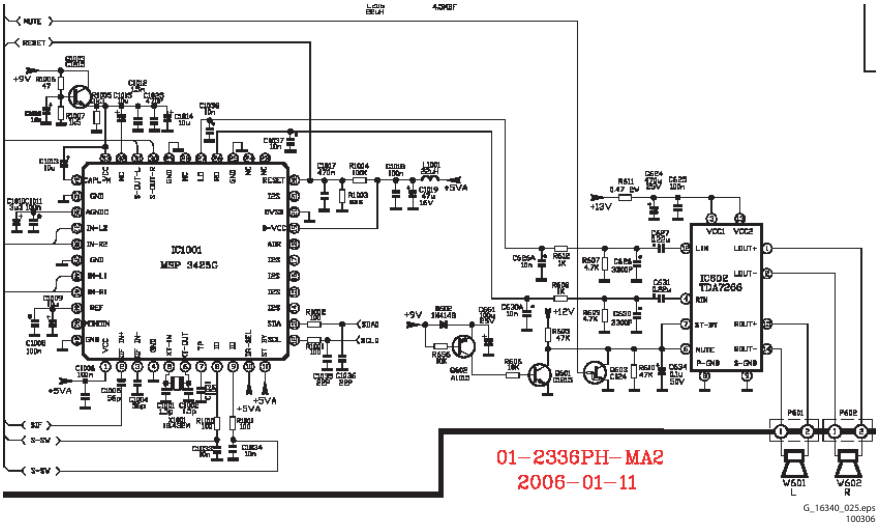

Figure 9-5 Sound process section 2

9.1.5 Vertical Output Section

This section mainly consists of IC301 (TDA8172), the Vertical Coil and the related circuit. The supply voltage of IC301 are +14V and -14V. These two voltages are provided by the LOT section. For the vertical scan, IC101 creates a Saw-tooth waveform at Pin16. This is the input signal of IC301. The main task of IC101 is to create the vertical scan waveform. The output signal of IC301 drives the Vertical Coil. If IC301 works in normal state, Pin6 will send a square-signal to maintain a high voltage at D214. If it does not, D214 will get a low voltage, Pin2 of IC101 senses this change and IC101 sends out a standby signal.

9.1.6 Horizontal Output and LOT Section

The horizontal drive pulse is a square wave. IC101 creates this waveform at Pin13. Via Q401 the signal goes to the input of Q411. Q411 is a horizontal output triode with a damper inside. The signal from Pin C of Q411 drives the Horizontal Coil. When Q411 goes into cut-off state, a sub-coil inside the LOT will generate an EHT by inductance.

9.2 IC description

9.2.1 Main IC (IC101)

Description:

The main IC is a TMPA8857CSNG, provided by TOSHIBA. It is an integrated circuit, suited for PAL, NTSC and SECAM TV. An MCU and a TV signal processor are integrated in a 64 pin DIP package.
The MCU contains an 8-bit CPU, ROM, RAM, I/O-ports, timer/counters, A/D-converters, an on-screen display controller, remote control interfaces, IIC bus interfaces, and the closed caption decoder.
The TV signal processor contains PIF, SIF, Video, multi-standard chroma, deflection, and RGB processors.

Features:

MCU:
- High speed 8-bit CPU
- 12 I/O ports
- I2C bus interface (multi-master)
- 14-bit PWM output, 1 channel, for a voltage synthesizer
- 7-bit PWM output, 1 channel
- 8-bit A/D converter, 3 channels
- Remote control signal preprocessor
- Two 16-bit internal timer/counters, 2 channels
- Two 8-bit internal timer/counters, 2 channels
- Time base timer
- Watchdog timer
- 16 interrupt sources: 5 external, 11 internal
- Stop and Idle power saving modes

CCD decoder
- Digital data slicer for NTSC

OSD
- Clock generation for OSD display
- Font ROM characters: 384 characters
- Characters display: 32 columns x 12 lines
- Composition: 16 x 18 dots
- Size of character: 3 (line by line)
- Color of character: 8 (character by character)
- Display position: H 256 / V 512 steps
- BOX function
- Fringing, smoothing, italic, underline function
- Conform to CCD regulation
- Jitter elimination

TV Processor

IF
- Integrated PIF VCO, aligned automatically
- Negative demodulation PIF
- Multi-frequency SIF demodulator, without external tank-coil

Video
- Integrated chroma traps
- Black stretch
- Y-gamma

Chroma
- Integrated chroma BPF's
- PAL/NTSC/SECAM demodulation

RGB/Base-band
- Integrated 1 H base-band delay line
- Base-band TINT control
- Internal OSD interface
- Half-tone and transparent for OSD
- External YCbCr interface for DVD
- RGB cut-off/drive controls by bus
- ABCL (ABL and ACL combined)

Synchronization
- Integrated fH x 640 VCO
- DC coupled vertical ramp output (single)
- EW correction with EHT output
- Sync out

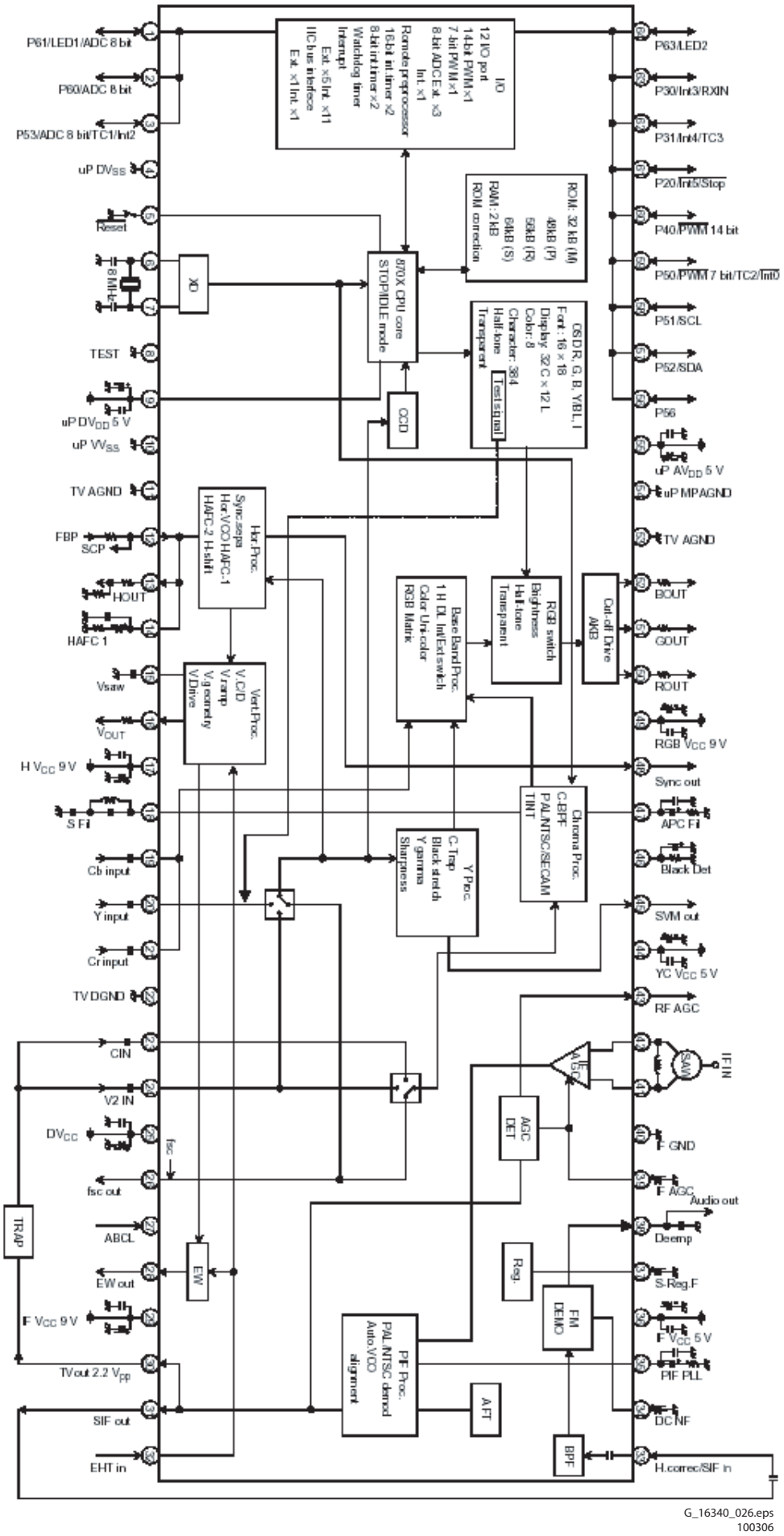

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Figure 9-6 Block Diagram Main IC 1

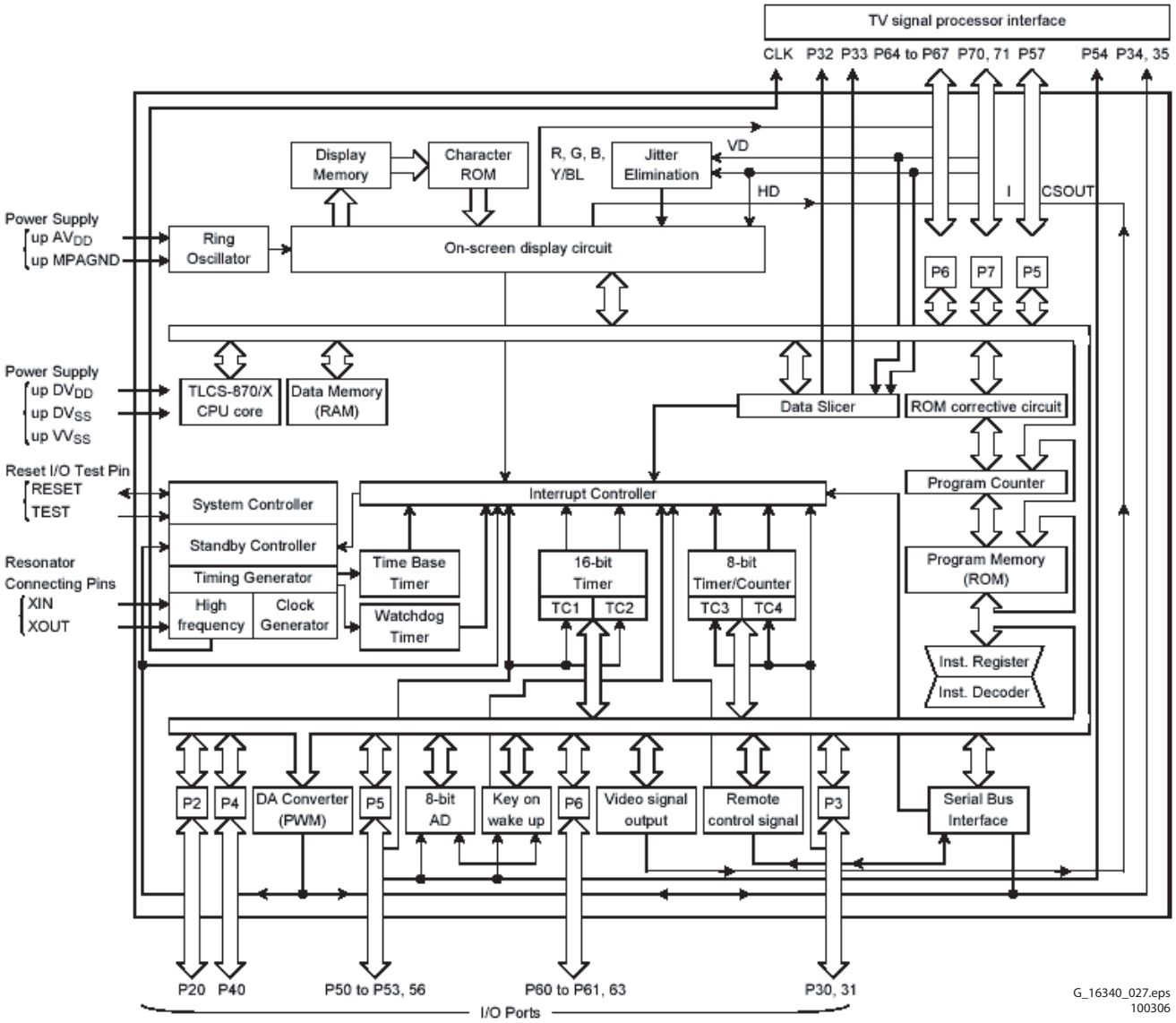

Figure 9-7 Block Diagram Main IC 2

9.2.2 Vertical Deflection Booster (IC 301)

The STV8172A is a vertical deflection booster, designed for TV and monitor applications.
This device, supplied with up to 35 V, provides a maximum output current of 2.5 A, to drive the vertical deflection yoke.
The internal fly back generator delivers fallback voltages of up to 75 V.

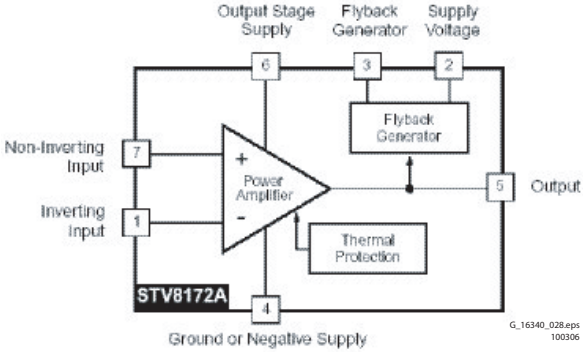

Figure 9-8 Vertical Deflection Booster

9.2.3 Demultiplexer (IC 901)

The HCF4052B is a monolithic integrated circuit, fabricated in Metal Oxide Semiconductor technology, available in DIP and SOP packages.
The HCF4052B analog multiplexer/demultiplexer is a digitally controlled analog switch, having low ON impedance, and very low OFF leakage current. This multiplexer circuit dissipates extremely low quiescent power over the full supply voltage range, independent of the logic states of the control signals. When a logic “1” is present at the inhibit input, all channels are off. This device is a differential 4-channel multiplexer, having 2 binary control inputs, A and B, and an inhibit input. The two binary input signals select 1 of 4 pairs of channels to be turned on and connect the analog inputs to the outputs.

Figure 9-9 Demultiplexer

Table 9-3 Demultiplexer

PIN	Symbol
1 and 2	Y CHANNELS IN/OUT
3	COMMON "Y" OUT/IN
4 and 5	Y CHANNELS IN/OUT
6	INH
7	VEE
8	VSS
9	B
10	A
11 and 12	X CHANNELS IN/OUT
13	COMMON "X" OUT/IN
14 and 15	X CHANNELS IN/OUT
16	VDD

9.2.4 Sound Processor (IC1001)

Table 9-4 Sound Processor

Pin No.	Pin Name	Type	Short Description
1	AVSUP		Analog power supply +5V
2	ANA_IN+	IN	IF Input 1
3	ANA_IN-	IN	IF common
4	TESTEN	IN	Test pin
5	XTAL_IN	IN	Crystal oscillator
6	XTAL_OUT	OUT	Crystal oscillator
7	TP		Test pin
8	D_CTR_I/O_1	IN/OUT	D_CTR_I/O_1
9	D_CTR_I/O_0	IN/OUT	D_CTR_I/O_0
10	ADR_SEL	IN	I2C BUS address select
11	STANDBYQ	IN	Stand-by (Low-active)
12	I2C_CL	IN/OUT	I2C clock
13	I2C_DA	IN/OUT	I2C data
14	I2S_CL		I2S clock
15	I2S_WS		I2S word strobe
16	I2S_DA_OUT		I2S data output
17	I2S_DA_IN1		I2S1 data input
18	ADR_CL		ADR clock
19	DVSUP		Digital power supply +5 V
20	DVSS		Digital ground
21	I2S_DA_IN2		I2S2 data input
22	RESETQ	IN	Power-on-reset
23	NC		Not connected
24	NC		Not connected
25	VREF2		Reference ground 2 High-voltage part
26	DACM_R	OUT	Loudspeaker out, right
27	DACM_L	OUT	Loudspeaker out, left
28	NC		Not connected
29	VREF1		Reference Ground 1 High voltage part
30	SC1_OUT_R	OUT	Audio 1 output, right
31	SC1_OUT_L	OUT	Audio 1 output, left
32	NC		Not connected
33	AHVSUP		Analog power supply 8.0V
34	CAPL_M		Volume capacitor MAIN
35	AHVSS		Analog ground
36	AGNDC		Analog reference voltage High-voltage part
37	SC2_IN_L	IN	Audio 2 input, left
38	SC2_IN_R	IN	Audio 2 input, right
39	ASG		Analog shield Ground
40	SC1_IN_L	IN	Audio 1 input, left
41	SC1_IN_R	IN	Audio 1 input, right
42	VREFTOP		Reference voltage IF A/D converter
43	MONO_IN	IN	Mono input
44	AVSS		Analog ground

9.2.5 Dual Bridge Amplifier (IC 602)

The TDA7266SA is a dual bridge amplifier, specially designed for LCD monitor, PC motherboard, TV, and portable radio applications.

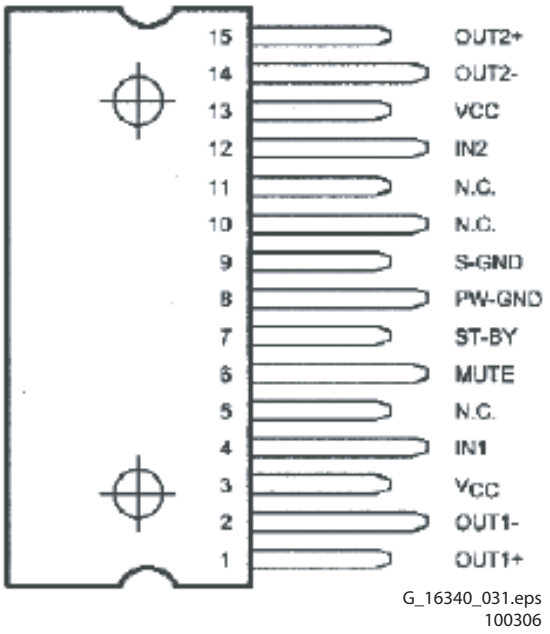

Figure 9-10 Dual Bridge Amplifier

10. Spare Parts List

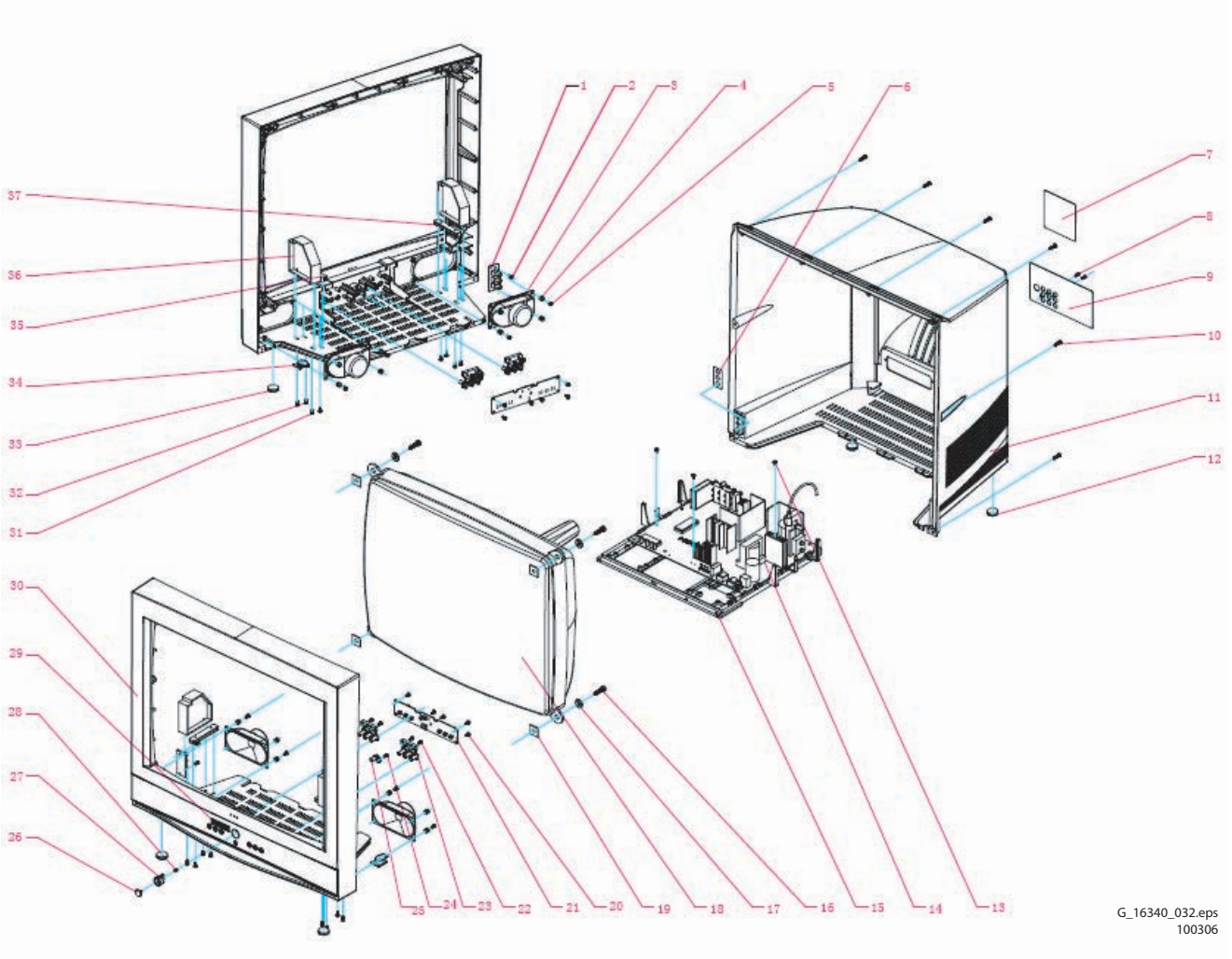

Figure 10-1 Spare Parts

Table 10-1 Spare Parts List

ITEM	NAME	QTY.	REMARK
1	Side AV PWB	1	
2	S/T Screw W 3 X 10 AB	2	MGT Side AV PWB.
3	Speaker	2	
4	Speaker Rubber Cushion	8	
5	S/T Screw W 3 X 14 HS	4	MGT Speaker
6	Side AV Inlay	1	
7	Plate Model NO.	1	
8	S/T Screw F 3 X 10 BT	2	MGT Rear AV Jack
9	Rear AV Inlay	1	
10	S/T Screw B 4 X 20 AB	8	MGT Rear and Front Cabinet
11	Rear Cabinet	1	
12	Cushion (25mm X 7mm)	2	
13	S/T Screw W 3 X 10 AB	3	MGT Main Board
14	Main Board	1	
15	Main Board Bracket	1	
16	CRT Screw HA 6 X 30	4	MGT CRT & Front Cabinet
17	Metal Cushion	4	
18	CRT	1	
19	Fibre Sheet	4	
20	S/T Screw W 3 X 10 AB	6	MGT KEY Board & Front Cabinet
21	Key Board	1	
22	S/T Screw W 3 X 10 AB	4	MGT Push Button

ITEM	NAME	QTY.	REMARK
23	Push Button	1	
24	S/T Screw W 3 X 10 AB	1	MGT Lens
25	Lens	1	
26	Decorative Piece for Power Knob	1	
27	Power Knob	1	
28	Power Spring	1	
29	Logo	1	
30	Front Cabinet	1	
31	S/T Screw W 3 X 10 AB	4	MGT CRT Support
32	S/T Screw W 3 X 10 AB	4	MGT Guide Rail
33	Cushion (25mm X 7mm)	2	
34	Power Line Block	1	
35	Guide Rail (Left)	1	
36	CRT Support	2	
37	Guide Rail (Right)	1	

11. Revision List

Manual xxxx xxx xxxx.0

- First release.